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PREVALENCE, DISTRIBUTION AND ATTRIBUTABLE RISKS OF CANNABIS USE IN YOUNG ADULTS WITH GENERALISED ANXIETY DISORDER AT A UNIVERSITY IN BOTSWANA

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ABSTRACT

Worldwide, cannabis is the most commonly used drug after tobacco and alcohol, especially among young adults. In Africa, cannabis use is often associated with mental health problems. However, few studies have been conducted to assess which mental health problems are linked to cannabis use, particularly among young adults. This study examined the prevalence, distribution and risks of cannabis use attributed to generalised anxiety disorders. Data from 615 young adults (Mean age = 22.15, ±2.55, 18 – 25; 60.2% female) were used to compute the prevalence and distribution of cannabis use and binary logistic regression models fitted to quantify the risk of using cannabis attributed to different levels of anxiety severity. Of the 615 respondents, 13.8%, 20.4% and 31.7% reported using cannabis in the past month, the past year and lifetime, respectively. Similarly, 11.2% were hazardous users and 5.2% had possible cannabis use disorders. The odds of using cannabis varied with the severity of anxiety symptoms. Compared to those with minimal anxiety problems, the risks of using cannabis ranged from 2.61 (95% Confidence Intervals (CI) 1.65-4.93) to 3.72 (95% CI: 2.10-6.61) for mild anxiety and from 3.68 (95% CI: 2.08 – 6.98) to 6.32 (95% CI: 2.40-16.64) for severe anxiety. Interventions to reduce cannabis use and its concomitant long-term negative consequences should target reducing anxiety problems among young adults. Practitioners should prioritise mental health literacy and programmes such as relaxation techniques and guided self-help interventions, which are known to be cheap, effective, and efficient in alleviating anxiety problems.

Keywords: Cannabis use; generalised anxiety disorder; young adults; Botswana.

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INTRODUCTION

Worldwide, cannabis is the most commonly-used drug after tobacco and alcohol, particularly among young adults (UNODC, 2021). By 2019, the global number of cannabis users had risen to about 200 million notwithstanding the link between regular use and a myriad of physical and mental health problems and the connection between potency and harm (UNODC, 2021). Moreover, the potency of cannabis products (i.e., higher delta-9-tetrahydrocannabinol [THC] content) has increased fourfold and young people who view cannabis as harmful has correspondingly decreased fourfold (UNODC, 2021). Moreover, the shifting climate of cannabis liberalisation globally has further fuelled the perception that cannabis is less harmful (Ganesh & D'Souza, 2022; Sobesky & Gorgens, 2016). Yet, results of previous studies suggest that up to one-third of all cannabis users, especially adolescents and young adults, go on to abuse, become dependent, and develop cannabis use disorder with devastating long-term health consequences (Lev-Ran et al., 2013). Worse still, cannabis use is also a gateway to the use and abuse of other drugs (e.g., cocaine), linked to violence and crime, and co-occur with other conditions (Lev-rav et al., 2013; Peltzer & Ramlagan, 2007; UNODC, 2021).

The rampant and long-term use of cannabis, especially in adolescence and young adulthood, has lasting negative physical, mental health and social consequences. In particular, persistent cannabis use with onset in adolescence has been shown to impair brain functions, cause diseases (e.g., respiratory or cardiovascular disorders), lead to emotional dysregulation, and is associated with psychopathology, for example, psychosis and other substance use disorders (Akirav, 2013; Carvalho and Van Bockstaele, 2012; Moore et al.,2007; Ramikie and Patel, 2012). Further, cannabis use is known to lead to cognitive and memory impairment (e.g., problems related to planning, decision making, attention problems, problem-solving, etc.), poor academic performance (Fergusson et al., 2015), reduced motivation and psychosocial dysfunction. Cannabis use has been linked to failure to follow schedules, learn new materials (Lubman et al., 2015; Volkow et al., 2016), prolonged psychotic episodes (e.g., hearing voices, delusions and erratic behaviour), and violent behaviours (Volkow et al., 2016; Dugré et al., 2017; Fergusson et al., 2015). Although many studies have been conducted on the relationship between cannabis use and the development of psychosis (Moore et al.,2007) and other mood disorders (Crippa et al.,2009; Feingold et al., 2015), little is known about the risk of using cannabis among people with anxiety disorders, especially in African countries.

Anxiety disorders are common and contribute considerably to the global disease burden with an estimated 260 million people living with anxiety disorders worldwide (Whiteford et al., 2013; WHO, 2017). Similarly, anxiety disorders affect one in six people in their lifetime and one in eight in any given year (Somers et al., 2006). Several previous studies have demonstrated a link between cannabis use and anxiety disorders (Degenhardt et al. 2001; Degenhardt et al. (2013), panic disorder (Zvolensky et al., 2006) and generalized anxiety disorder (Kessler et al., 2002). Although evidence has accumulated in developed countries about a

possible link of cannabis use with various anxiety disorders, little is known about the associations between cannabis use and generalised anxiety disorders in African countries.

Like in many African countries, Botswana has numerous contextual factors that may confer the risks of anxiety disorders on young adults. These contextual factors include, *inter alia*, low socioeconomic status, high prevalence of HIV/AIDS, increased incidence of alcohol and substance abuse, family dysfunction, lack of social capital and support, exposure to domestic violence, traumatic events, and childhood maltreatment (Amone-P'Olak & Letswai, 2020; Hetolang & Amone-P'Olak, 2018; Misra & Castillo, 2004; Moitlakgola & Amone-P'Olak, 2015; Mongale & Amone-P'Olak, 2019; Phillip & Amone-P'Olak, 2019; Morutwa & Plattner, 2014; Thorsteinsso, et al., 2013; Toteng & Amone-P'Olak, 2019). Even though these contextual factors are linked to anxiety disorders, few studies have been conducted to assess the extent to which anxiety disorders predispose to cannabis use among young adults in Botswana, particularly those in institutions of higher learning. The few studies conducted on anxiety were on people living with HIV/AIDS (Lawler et al., 2011; Onyewadume, 2008; Wang et al., 2020) and the elderly (Mutepfa et al., 2020). Particularly among young adults in colleges and universities, social stressors such as high academic demands, relationship problems with peers, parents and lecturers, financial difficulties, and worries about the future, especially in these times of COVID-19 pandemic, are all fertile grounds for anxiety problems to thrive (Machell et al., 2016; Othman et al., 2019; Pisarik et al., 2017; Syed & Nemeroff, 2017; Worfel et al., 2016). Consequently, many young adults distressed by social stressors may experience anxiety and subsequently use cannabis to try to overcome their anxiety symptoms. Indeed, a previous study with the same population showed that young adults use cannabis to cope with psychological or social distress (Kgatitswe & Amone-P'Olak, 2017). Based on the literature highlighted above, it is expected that exposure to anxiety would be associated with a high prevalence and increased risks of cannabis use.

Theoretical and conceptual framework

The current study is guided by the Social Stress Theory (SST) (Pearlin et al., 1981; Pearlin, 1989) and the self-medication hypothesis (Khantzian, 1987). The SST is anchored on three tenets: the source of stress, the outcome of the stress, and mediators. The SST posits that exposure to sources of life stressors such as high academic demands, COVID-19 worries, the possibility of future unemployment, and relationship difficulties besides the contextual factors such as poverty, high prevalence of HIV/AIDS, family dysfunction, lack of social capital and support, and exposure to violence and traumatic events, outlined above, exponentially increases the risks of outcomes such as cannabis use, particularly in young adults with anxiety disorders (Kgatitswe & Amone-P'Olak, 2017; Ludick & Amone-P'Olak, 2016; Pearlin, 1989; Pearlin et al., 1981; Pearlin & Bierman, 2013). Besides, the SST recognises that those who are susceptible to the circumstances outlined above are liable to heightened risks of concomitant mental health problems such as anxiety disorders (Pearlin & Bierman, 2013).

Similarly, the self-medication hypothesis postulates that young adults use

cannabis to reduce the levels of psychological distress they may be experiencing (Khantzian, 1987). The self-medication theory is predicated on the notion that folks use substances such as cannabis to relieve psychological distress or to ease unpleasant emotional states (Khantzian, 1977; 1974). In other words, just as they use pain killers to ease pain, young adults use cannabis to alleviate emotional distress due to the burden of numerous life stressors they may be encountering.

This study is from the research project, "Childhood Adversity and Early Adult Outcomes in Institutions of Higher Learning" which aims to assess childhood adversity, mental health and behavioural outcomes and experiences of young adults in institutions of higher learning in Botswana. Knowledge of young adults in general and those in institutions of higher learning, in particular, is vital for planning the human resources of a developing country with a youthful population such as Botswana where the use of cannabis is increasing. Habitual use of cannabis during critical developmental windows such as during adolescence and young adulthood is harmful and impedes the developmental trajectories underpinning the maturation of cognitive, emotional, and social capacities that are key for successful adulthood. This study assessed the prevalence, distribution, and risks of cannabis use in young adults attributable to generalised anxiety disorders. Specifically, the objectives of the study were to 1) assess the prevalence of cannabis use and anxiety symptoms, 2) examine the distribution of cannabis use at different levels of generalised anxiety disorders, and 3) quantify the risks of cannabis use attributable to different levels of severity of anxiety symptoms.

METHOD

Research design and sample

This study employed a cross-sectional design with a convenient sample of students randomly drawn from various faculties and years of study at the University of Botswana. The G*Power (v3.1.9.2) software (Faul et al. 2009) was used to calculate the sample size and power analysis using its regression statistical analysis procedure. The power analysis yielded a sample size of 600 participants after setting the effect size at 0.8, a significance level of $\alpha = 0.05$, and a statistical power of $1\text{-}\beta = 0.8$. In total, 660 participants were asked to take part in the study. Forty-five (45) students over the age of 25 and those with incomplete data were excluded from the study. Finally, data from 615 respondents (60.2% female) were used in the analyses representing 93.2 per cent of those who were initially invited.

Procedure

Data collection from classrooms and lecture halls in the faculties was achieved with the cooperation and permission of faculty registrars and lecturers. Before data collection, information on research purpose, respondents' rights, confidentiality, and anonymity were given to respondents. Thereafter, participants signed a consent form before the questionnaires were distributed. The questionnaires took about 10 – 15 minutes to complete.

Approval for the current study was obtained from the Institutional Review Board of the University of Botswana in line with international agreements and protocols. Immediately after data collection, the participants were provided with contacts of two psychological services at

the Student Centre and the Psychology Clinic at the Department of Psychology to cater for participants who would be affected by their participation in the study and would require psychological support. Both the Student Centre and the Psychology Clinic are located on the University of Botswana campus.

Measures

Three different categories of measures were used in this study: first, self-developed measures to collect information on the socio-demographic characteristics such as age, sex, educational attainment, etc. Second, the standard Cannabis Use Disorder Identification Test-Revised - CUDIT-R (Adamson et al., 2010) was used to assess cannabis use, and finally, the 7-item generalised anxiety disorder (GAD-7) was used to assess generalised anxiety disorders.

***Socio-demographic characteristics*:** participants indicated their sex, age, year of study, place of upbringing, and the educational attainment of the mother or female guardian and father or male guardian, among others.

Cannabis Use Disorder Identification Test - CUDIT-R (Adamson et al., 2010): The revised 8-item CUDIT–R scale was used to assess the severity of cannabis use: nonusers (score=0), non-problematic use (scores 1-7), hazardous use (scores ≥ 8), and possible cannabis use disorder (scores ≥ 12). The CUDIT-R measures cannabis use in the past six months and is scored by adding each of the 8 items with items 1 through 7 scored on a 0 – 4 scale and item 8 is scored 0, 2 or 4 (Adamson et al., 2010). The psychometric property of CUDIT-R is acceptable with the high internal consistency ranging from .72 to .92, sensitivity at 91% and specificity at 90% (Adamson et al., 2010). The items on the CUDIT-R include, among others, "How often do you use cannabis?", "How often during the past 6 months did you fail to do what was normally expected from you because of using cannabis?", and "How often during the past 6 months have you had a feeling of guilt or remorse after using cannabis?". The internal consistency of the CUDIT-R scale for this study measured using Cronbach alpha was acceptable at **α**=.83.

Generalised Anxiety Disorder (GAD). The GAD-7 is a brief measure of the generalised anxiety disorder scale developed by Spitzer and colleagues (2006) for assessing anxiety problems. The GAD-7 is a self-report measure of the extent to which one is bothered by anxiety problems over the past two weeks. Examples of the items on the GAD-7 include "Feeling nervous, anxious, or on edge", "Trouble relaxing", "Feeling afraid, as if something awful might happen", etc. The anxiety problems are rated on a 4-point Likert-type scale ranging from "0" (not at all) to "3" (nearly every day). The scores ranged from 0 – 21 and are classified as follows: scores 0–4 (minimal anxiety), 5–9 (mild anxiety), 10–14 (moderate anxiety), and 15–21 (severe anxiety) (Spitzer et al., 2006). The internal consistency of the GAD-7 as assessed by Cronbach alpha in previous studies ranged from α=.89 to α=.94 with test-retest reliability of .75 (Lowe et al., 2008; Ruiz et al., 2011). Higher scores are indicative of more severe anxiety problems. In this study, the internal consistency coefficient (Cronbach alpha) of the GAD-7 was acceptable at .86.

Data analysis

First, we computed the demographic characteristics of the participants such as age, gender, prevalence and distributions of both cannabis use and anxiety problems using descriptive statistics (e.g., mean, standard deviation, and range) and presented the results in a table and a bar chart. Second, gender differences in cannabis use and anxiety problems were assessed using a t-test. Finally, three separate binary logistic regression analyses were performed to assess the attributable risk of cannabis use as an outcome variable (binary-coded as "0" [nonusers] contrasted with "1-7" [non-problematic users]; "0" contrasted with "8" [hazardous users] or more; and "0" contrasted with "12" or more [possible cannabis use disorder]) at various levels of anxiety problems (mild (scores=5-9); moderate (scores=10-14); and severe anxiety (scores=15-21) relative to the minimal (scores=0-4) level of anxiety problems. All statistical analyses were carried out using IBM SPSS Statistical Software [Version 27, 2020]. Odds ratios were supplied with 95% confidence intervals (95% CI) and the level of significance was set at $\boldsymbol{p} < 0.05$ (two-sided).

RESULTS

Sample characteristics

The socio-demographic characteristics of the respondents are presented in Table 1. Respondents were 615 students (*Mean age* = 22.15 ±2.55; 60.2% female). On average, male respondents were slightly older than their female peers and the majority were drawn from first and second years of study. Most of the respondents reported that they were brought up in the villages or towns. Similarly, most of the students reported attending public secondary schools fully funded by the government and were currently progressing well in their academic programmes at the university (Table 1).

Prevalence of cannabis use and generalised anxiety disorder

The prevalence of cannabis use and GAD are shown in Table 2. The past month, the past year and lifetime cannabis use were relatively higher than in previous studies with the same population (Toteng & Amone-P'Olak, 2019). Past month, the past year and lifetime cannabis use were significantly higher in male than female students (Table 2). Similarly, male and female participants significantly differed regarding hazardous use and possible cannabis use disorder with male respondents engaging in more hazardous use and possible cannabis use disorder than their female counterparts (Table 2). Regarding GAD, 21.5 per cent and 13.0 per cent scored in the moderate and severe range, respectively. On the contrary, female respondents scored significantly higher than their male counterparts on anxiety problems (Table 2).

The distribution of cannabis use at different levels of anxiety severity is presented in Figure 1. Generally, cannabis use markedly increased with the severity of anxiety problems with a steeper gradient observed for moderate and severe levels of anxiety (Figure 1).

Attributable risk of cannabis use at different levels of anxiety severity

The results of the risk of using cannabis (outcome variable) at different levels of anxiety symptoms (predictor variable) are presented in Table 3. Compared to those suffering from minimal anxiety, the attributable risks of using cannabis for those with mild to severe anxiety problems ranged from 2.61 (95% Confidence Intervals (CI) 1.65-4.95) to 3.72 (95% CI: 2.10-6.61) and

Table 1. Sociodemographic characteristics of study participants (*N*=615)

Variable name	
Age	22.15 (***SD***=2.55)
	***n* (%)**
Gender	
Male	245 (39.8%)
Female	370 (60.2%)
Participants	
Year 1	202 (32.9)
Year 2	183 (29.7)
Year 3	86 (14.0)
Year 4	125 (20.3)
Year 5	19 (3.1)
CGPA	
2.00 – 2.99	173 (28.2%)
3.00 – 3.99	332 (53.9%)
4.00 – 4.69	85 (13.8%)
4.70 – 5.00	25 (4.1%)
Place of up-bringing	
Cattle post	44 (7.2%)
Village	242 (39.4%)
Town	157 (25.5%)
City	172 (27.9%)
School attended	
Public	421 (68.5%)
Private	103 (16.7%)
Both public and private	91 (14.8%)

Key: ***N***=total number; ***n***=sub-population, ***SD***=Standard deviation, **CGPA**=Cumulative Grade Point Average

at moderate anxiety level, the odds of using cannabis ranged from 3.18 (1.72-7.93) to 4.90 (2.22-10.75) (see Table 3). Finally, the odds of using cannabis were 3.68 (95% CI: 2.08 – 6.98) to 6.32 (95% CI: 2.40 – 16.64) times greater for those suffering from severe anxiety (Table 3).

DISCUSSION

From inception, this study sought to examine the prevalence, distribution, and risks of cannabis use attributed to generalised anxiety disorder in young adults attending a university in Botswana. The results indicate a high prevalence of cannabis use and generalised anxiety disorder. Markedly higher odds of using cannabis were observed in young adults who suffer from moderate to severe levels of anxiety. These results are in line with the social stress theory (Pearlin et al., 1981; Pearlin, 1989) and the self-medication hypothesis (Khantzian, 1987). The social stress theory postulates that exposure to a high density of life stressors was associated with mental health problems such as anxiety disorders. Hence, to cope with anxiety problems, many young adults

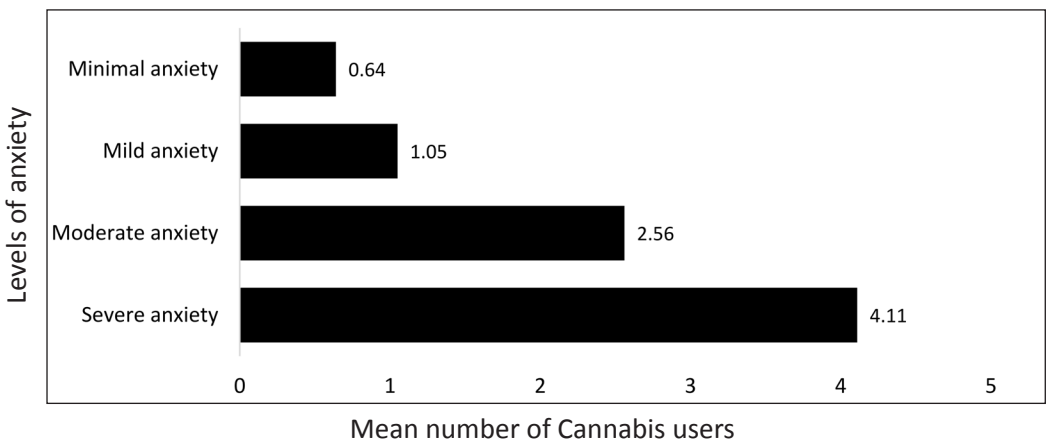
may choose to use cannabis to cope with anxiety problems (UNODC, 2021).

The results of this study are further evidence that interventions to reduce cannabis use in young adults should target anxiety disorders and other mental health problems to decrease negative behavioural outcomes like cannabis use and its associated adverse effects. Early intervention to tackle cannabis use is critically important as nearly a third of cannabis users go on to develop cannabis

Table 2. Prevalence and distribution of cannabis use and severity of anxiety stratified by gender

Variable	Total (*N*=615)	Male (*n*=245)	Female (*n*=370)	t-test (*df*=614)
Cannabis use				
Past 30 days	90 (15.8%)	57 (67.1%)	28 (32.9%)	**2.69***
Past year	125 (20.4%)	79 (63.2%)	46 (36.8%)	**3.22****
Lifetime	190 (31.7%)	112 (57.4%)	83 (42.6%)	**3.18***
CUDIT-R (total score)	2.09 (*SD*=4.59)	3.46 (*SD*=5.99)	1.05 (*SD*=2.66)	**4.94*****
Score 0 (nonusers)	442 (71.9%)	206 (46.6%)	236 (53.4)	
Score 1-7 (non-problematic users)	104 (16.9%)	70 (67.3%)	34 (32.7)	
Score ≥ 8 (hazardous use)	69 (11.2%)	49 (71.0%)	20 (29.0%)	
Score ≥ 12 (possible cannabis use disorder)	32 (5.2%)	25 (78.2)	7 (21.8%)	
Generalised Anxiety Disorder (GAD-7 scores)	8.26 (*SD*=5.52)	6.22 (*SD*=4.17)	10.30 (*SD*=5.12)	**5.79*****
Minimal anxiety	232 (37.7%)	97 (41.8%)	135 (58.2%)	
Mild anxiety	171 (27.8%)	70 (40.9%)	101 (59.1%)	
Moderate anxiety	132 (21.5%)	49 (37.1%)	83 (62.9%)	
Severe anxiety	80 (13.0%)	29 (35.3%)	51 (63.7%)	

Key: M=mean; N=total sample; n=subpopulation; SD= standard deviation; %= per cent; CUDIT-R= revised version of the Cannabis Use
Disorder Identification Tool; MHP= mental health problems; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$



Key: *SD*=Standard Deviation.
Figure 1. Cannabis users' mean scores at different levels of Anxiety severity

Table 3. Logistic regression analyses: attributable risks of Cannabis Use at different levels of anxiety (*N*=615)

		Predictor variable (levels of anxiety)			
Outcome variable CUDIT-R scores	**N**	**Reference Minimal anxiety (95% CI)**	**Mild anxiety (95% CI)**	**Moderate anxiety (95% CI)**	**Severe anxiety (95% CI)**
< 8	615	1.00	2.61 (1.65 – 4.93)	3.18 (1.72 – 7.93)	3.68 (2.08 – 6.98)
8 or more	615	1.00	2.62 (1.46 – 14.82)	3.45 (1.89 – 6.31)	4.13 (1.92 – 8.91)
12 or more	615	1.00	3.72 (2.10 – 6.61)	4.90 (2.22 – 10.75)	6.32 (2.40 – 16.64)

Key: **N** = number; **OR** = Odds Ratio; **CI** = Confidence Interval; %=per cent;
CUDIT-R = Cannabis Use Disorder Identification Test – Revised.

use disorders with devastating health and social consequences (Lev-Ran et al., 2013; UNODC, 2021). Consequently, the results of our study is a useful addition to the literature on mental health and drug and substance abuse in African countries where such studies are rare.

With the prevalence of hazardous cannabis use at 11.2 per cent and possible cannabis use disorder at 5.2 per cent, cannabis use in this sample was relatively high compared to the 6.4 per cent (range 3.8–8.8 %) prevalence in the population aged 15–64 in Africa (UNODC, 2021). A previous study with the same population demonstrated that the motive for cannabis use among young adults was novelty seeking and coping with psychological distress (Kgatitswe & Amone-P'Olak, 2017; Ludick & Amone-P'Olak, 2016). It is, therefore, possible that many young adults are using cannabis as self-medication to cope with numerous emotional and psychological distress, in line with the self-medication hypothesis espoused by Khantzian (1987). In another previous study with the same population, we demonstrated that stressful life events and childhood maltreatment were, indeed, linked to mental health problems such as depression (Amone-P'Olak & Letswai, 2020; Hetolang & Amone-P'Olak, 2018) and are also known to co-occur with anxiety disorders (Lev-Ran et al., 2013). Interventions should therefore target young adults with a background of high densities of stress and mental health problems to reduce cannabis use as demonstrated in this study.

Aside from being a global public health concern, hazardous cannabis use and possible cannabis use disorder do not only hinder life opportunities but contribute to serious physical and mental health problems, poor quality of life, poor quality of the future workforce, and is a gateway to violence, crime and other drug use such as cocaine (UNODC, 2021). Therefore, understanding the prevalence, the distributions and the attributable risks of cannabis use associated with anxiety problems are vital for designing interventions to mitigate the negative consequences of cannabis use, thus benefitting not only the young adults but society as a whole (Mongale & Amone-P'Olak, 2019). Future research should not only study factors associated with mental health problems such as life stressors and childhood adversity and the associated mental health consequences but also the mechanisms through which mental health problems are linked to drug and substance abuse. Mainly, future studies should focus on

modifiable mediators and moderators of mental health problems on drug and substance abuse. Studies on the moderators and mediators of the relations between mental health problems and drug and substance abuse are beyond the scope of the current study and will be considered in future research.

Several pathways that may lead to anxiety disorders and eventual drug use include social environments associated with anxiety disorders, drug and substance abuse, and emotional reactivity to the adverse social environment. First, several previous studies indicate that childhood maltreatment (e.g., physical abuse, emotional neglect, sexual abuse etc.) and familial environments such as poverty, conflicts, parental separation and divorce, drug and substance abuse, domestic abuse and violence, among others, are all related to psychopathology such as mood and anxiety disorders (Amone-P'Olak & Letswai, 2020; Amone-P'Olak et al. 2009; McLaughlin et al., 2010; Mongale & Amone-P'Olak, 2019; Ramotuana & Amone-P'Olak, 2020; Toteng & Amone-P'Olak, 2019). Subsequently, people with better childhood environments, social capital and support have lower odds of developing mood and anxiety disorders than those with adverse social backgrounds (McLaughlin et al., 2010). In turn, mood and anxiety disorders are known to predispose to abusing drugs and substances such as cannabis (McLaughlin et al., 2010).

Second, exposure to stressful life events is another possible pathway to increased liability to mood and anxiety disorders (Heim & Nemeroff, 2001; Loman & Gunnar, 2010). Anxiety disorders, in turn, lead to heightened emotional reactivity to stress and dysregulation in the autonomic nervous system and the hypothalamic-pituitary-adrenal axis (Heim & Nemeroff, 2001; Loman & Gunnar, 2010; McLaughlin et al., 2010). Dysregulation is known to be associated with maladaptive emotions and social dysfunction (McLaughlin et al., 2010) which young adults may react to by using drugs such as cannabis to alleviate maladaptive emotions such as anxiety disorder. This is in line with the self-medication hypothesis (Khantzian, 1987).

Third, experiencing maltreatment in childhood hinders the development of adaptive emotion regulation skills (Repetti et al., 2002). Exposure to stressful life events and chronic stressors have been suggested to increase emotion dysregulation, anxiety sensitivity, and perception of threat (McLaughlin et al., 2010). Consequently, young adults with a background of chronic stress may see their environment as full of stressors, hence, they constantly scan the environment for stress with no chance to relax (Sapolsky, 2002), which, in turn, cascades to lifelong mood and anxiety disorders which may predispose to drug and substance abuse (McLaughlin et al., 2010). Hence, variation in childhood social milieu that is linked to emotional reactivity predispose to stress in early adulthood, Therefore, in line with the self-medication hypothesis (Khantzian, 1987), young adults who experience difficulties regulating their mood and anxiety disorders (e.g., impulsivity) are prone to use drugs such as cannabis in an attempt to lower their heightened emotions and psychological distress.

The results of the current study need to be interpreted with caution due to many limitations. First, due to the cross-sectional survey design, it is difficult to exclude the possibility that the severity of anxiety attributed to cannabis use, may, at least in

part, be reciprocal, as there was no baseline information on anxiety symptomatology and the specific time when cannabis use was initiated. Second, information on both anxiety and cannabis use was based on self-report, thus prone to bias arising from the same source variance and social desirability. These biases might have led to under-reporting and by extension lower attributable risks of cannabis use at different levels of anxiety problems. Finally, university students used as a sample in the study may not be representative of the general population of young adults in Botswana, thus, jeopardising the generalisability of the results to out-of-school young adults.

The policy and practical implications of the current study include programmes for study and psychological support targeting students with anxiety problems. Consequently, interventions by policymakers and university social services should include mental health literacy, drug education and counselling services in universities. Especially, interventions should prioritise easing anxiety symptoms and other mental health problems that predispose to cannabis use. For example, interventions such as guided self-help programmes are known to be cheap, effective, and efficient in reducing anxiety (Cuijpers & Schuurmans, 2007). Further, guided self-help interventions involve less staff time, can be computer-adapted and are more appropriate in situations where healthcare workers are few and stigma against mental health problems strong.

CONCLUSION

The results of the current study are a clear demonstration of a strong association between cannabis use and anxiety disorders. Past month, the past year and lifetime use of cannabis was relatively high and the odds of using cannabis significantly increased with severity of anxiety, particularly in participants with moderate and severe anxiety disorders. Interventions to reduce cannabis use and its concomitant long-term negative consequences should target reducing anxiety disorders. Practitioners should prioritise psycho-education (e.g., mental health literacy, drug education) and interventions such as relaxation, guided self-help programmes, both considered to be cheap, effective, and efficient in alleviating anxiety symptoms. Other anxiety management techniques such as positive self-talk, imaginary exposure, and contra-conditioning may also prove to be useful.

REFERENCES

Adamson SJ, Kay-Lambkin FJ, Baker AL, Lewin TJ, Thornton L, Kelly BJ, and Sellman JD. (2010). An Improved Brief Measure of Cannabis Misuse: The Cannabis Use Disorders Identification Test – Revised (CUDIT-R). *Drug and Alcohol Dependence* 110:137-143.

Akirav, I. (2013). Cannabinoids and glucocorticoids modulate emotional memory after stress. *Neuroscience & Biobehavioral Reviews*, *37*(10), 2554-2563.

Amone-P'Olak, K., Burger, H., Ormel, J., Huisman, M., Verhulst, F.C., Oldehinkel, A.J. (2009). Socio-economic position and mental health problems in pre- and early adolescents: The TRAILS study. *Soc Psychiatry Psychiatr Epidemiol*, 44(3): 231-238. https://doi.org/10.1007/s00127-008-0424-z.

Amone-P'Olak, K., & Letswai N.K. (2020). The relationship between adverse childhood experiences and depression: A cross-sectional survey with university students in Botswana. *South African Journal of Psychiatry*. 2020; 26(0) a1444, 1-8. https://doi.org/10.4102/sajpsychiatry.v26i0.1444.

Carvalho, A. F., & Van Bockstaele, E. J. (2012). Cannabinoid modulation of noradrenergic circuits: implications for psychiatric disorders. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, *38*(1), 59-67.

Crippa, J. A., Zuardi, A.W., Martin-Santos, R., Bhattacharyya, S., Atakan, Z., McGuire, P., Fusar-Poli, P., 2009. Cannabis and anxiety: a critical review of the evidence. *Hum. Psychopharmacol*. 24, 515–523.

Cuijpers, P. & Schuurmans, J. (2007). Self-help interventions for anxiety disorders: an overview. *Current Psychiatry Reports*, 9:284-290.

Degenhardt, L., Cheng, H., Anthony, J.C., 2007. Assessing cannabis dependence in community surveys: methodological issues. *Int. J. Methods Psychiatr. Res.*16, 43–51.

Degenhardt, L., Coffey, C., Romaniuk, H., Swift, W., Carlin, J.B., Hall, W.D., Patton, G. C., 2013. The persistence of the association between adolescent cannabis use and common mental disorders into young adulthood. *Addiction* 108,124–133.

Dugré, J. R., Dellazizzo, L., Giguère, C. É., Potvin, S., & Dumais, A. (2017). Persistency of cannabis use predicts violence following acute psychiatric discharge. *Frontiers in psychiatry*, *8*, 176.

Faul, F., E. Erdfelder, A. Buchner, and A.-G. Lang. 2009. "Statistical Power Analyses using G*Power 3.1: Tests for Correlation and Regression Analyses." *Behavior Research Methods* 41:1149–60. https://doi.org/10.3758/BRM.41.4.1149.

Fergusson, D. M., Boden, J. M., & Horwood, L. J. (2015). Psychosocial sequelae of cannabis use and implications for policy: findings from the Christchurch Health and Development Study. *Social Psychiatry and Psychiatric Epidemiology*, *50*(9), 1317-1326.

Ganesh, S., & D'Souza, D. C. (2022). Cannabis and Psychosis: Recent Epidemiological Findings Continuing the "Causality Debate". *American Journal of Psychiatry*, *179*(1), 8-10.

Heim, C. & Nemeroff, C.B. (2001). The role of childhood trauma in the neurobiology of mood and anxiety disorders: preclinical and clinical studies. *Biological Psychiatry*, 49: 1023-1039.

Hetolang, L. T., & Amone-P'Olak, K. (2018). The associations between stressful life events and depression among students in a university in Botswana. *South African Journal of Psychology*, *48*(2), 255-267.

Kessler, R.C., Andrade, L.H., Bijl, R.V., Offord, D.R., Demler, O.V., Stein, D.J., 2002. The effects of co-morbidity on the onset and persistence of generalized anxiety disorder in the ICPE surveys. International Consortium in Psychiatric Epidemiology. *Psychol. Med.* 32,1213–1225.

Kgatitswe, B. M., & Amone-P'Olak, K. (2017). Motivation to use cannabis among young adults at a University in Botswana. *African Journal of Drug and Alcohol Studies*, *16*(2), 83-94.

Khantzian, E. J. (1987). The self-medication hypothesis of addictive disorders:

focus on heroin and cocaine dependence. *The cocaine crisis*, 65-74.

Lawler, K., Mosepele, M., Seloilwe, E., Ratcliffe, S., Steele, K., Nthobatsang, R., & Steenhoff, A. (2011). Depression among HIV-positive individuals in Botswana: a behavioral surveillance. *AIDS and Behavior*, *15*(1), 204-208.

Lev-Ran, S., Le Foll, B., McKenzie, K., George, T. P., & Rehm, J. (2013). Bipolar disorder and co-occurring cannabis use disorders: characteristics, co-morbidities and clinical correlates. *Psychiatry Research*, *209*(3), 459-465.

Loman, M.M. & Gunnar, M.R. (2010). Early experience and the development of stress reactivity and regulation in children. *Neurosci Biobehav Rev*, 34:867-876.

Löwe, B., Decker, O., Müller, S., Brähler, E., Schellberg, D., Herzog, W., & Herzberg, P. Y. (2008). Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. *Medical Care*, 266-274.

Lubman, D. I., Cheetham, A., & Yücel, M. (2015). Cannabis and adolescent brain development. *Pharmacology & Therapeutics*, *148*, 1-16.

Ludick, W.K. & Amone-P'Olak, K. (2016). Temperament and the risk of alcohol, tobacco, and cannabis use among university students in Botswana. *African Journal of Drug & Alcohol Studies, 15(1), 21-35.*

McLaughlin, K.A., Kubzansky, L.D., Dunn, E.C., Waldinger, R., Vaillant, G., Koenen, K.C. (2010). Childhood social environment, emotional reactivity to stress, and mood and anxiety disorders across the life course. *Depression and Anxiety*, 27: 1087-1094.

Machell, K. A., Rallis, B. A., & Esposito-Smythers, C. (2016). Family environment as a moderator of the association between anxiety and suicidal ideation. *Journal of Anxiety Disorders*, *40*, 1-7.

Misra, R., & Castillo, L. G. (2004). Academic stress among college students: Comparison of American and international students. *International Journal of Stress Management*, *11*(2), 132.

Moitlakgola, K. K., & Amone-P'Olak, K. (2015). Stressful life events and alcohol use among university students in Botswana. *African Journal of Drug and Alcohol Studies*, *14*(2), 81-93.

Mongale, N., & Amone-P'Olak, K. (2019). Childhood family environment and depression in early adulthood in Botswana. *Southern African Journal of Social Work and Social Development*, *31*(3), 1-18.

Moore, T. H., Zammit, S., Lingford-Hughes, A., Barnes, T. R., Jones, P. B., Burke, M., & Lewis, G. (2007). Cannabis use and risk of psychotic or affective mental health outcomes: a systematic review. *The Lancet*, *370*(9584), 319-328.

Morutwa, G., & Plattner, I. E. (2014). Self-control and alcohol consumption among university students in Botswana. *African Journal of Drug and Alcohol Studies*, *13*(2), 69-78.

Mutepfa, M. M., Motsamai, T. B., Wright, T. C., Tapera, R., & Kenosi, L. I. (2020). Anxiety and somatization: prevalence and correlates of mental health in older people (60+ years) in Botswana. *Aging & Mental Health*, 1-10.

Onyewadume, M. A. (2008). HIV/AIDS-anxiety among adolescent students in Botswana. *International Journal for the Advancement of Counselling*, *30*(3), 179-188.

Othman, N., Ahmad, F., El Morr, C., & Ritvo, P. (2019). Perceived impact of contextual determinants on depression, anxiety and stress: a survey with university students. *International Journal of Mental Health Systems*, *13*(1), 1-9.

Pearlin, L.I. (1989). The sociological study of stress. *J Health Soc Behav*, 30(3):241–256

Pearlin, L.I., & Bierman, A. (2013). Current issues and future directions in research into the stress process. In: Aneshensel, C.S., Phelan, J.C., Bierman, A. (eds) *Handbook of the sociology of mental health*. Springer Science Business, Media Dordrecht, New York.

Pearlin, L.I., Menaghan, E.G., Lieberman, M.A., & Mullan, J.T. (1981). The stress process. *J Health Soc Behav,* 22:337–356

Peltzer, K., & Ramlagan, S. (2007). Cannabis use trends in South Africa. *South African Journal of Psychiatry*, *13*(4), 126-131.

Phillip, O., & Amone-P'Olak, K. (2019). The influence of self-reported childhood sexual abuse on psychological and behavioural risks in young adults at a university in Botswana. *South African Journal of Psychology*, *49*(3), 353-363. stress causation and/or stress generation. *Anxiety, Stress, & Coping*, *28*(4), 357-371.

Pisarik, C. T., Rowell, P. C., & Thompson, L. K. (2017). A phenomenological study of career anxiety among college students. *The Career Development Quarterly*, *65*(4), 339-352.

Ramikie, T. S., & Patel, S. (2012). Endocannabinoid signaling in the amygdala: anatomy, synaptic signaling, behavior, and adaptations to stress. *Neuroscience*, *204*, 38-52.

Ramotuana, B. K., & Amone-P'Olak, K. (2020). Family type predicts mental health problems in young adults: A survey of students at a university in Botswana. *South African Journal of Social Work and Social Development, 32*(2) 17 pages. https://doi.org/10.25159/2415-5829/6823

Repetti, R.L., Taylor, S.E., Seeman, T.E. (2002). Risky families: family social environments and the mental and physical health of offspring. *Psychol Bull*, 128:330-336.

Ruiz, M. A., Zamorano, E., García-Campayo, J., Pardo, A., Freire, O., & Rejas, J. (2011). Validity of the GAD-7 scale as an outcome measure of disability in patients with generalized anxiety disorders in primary care. *Journal of Affective Disorders*, *128*(3), 277-286.

Sobesky, M., & Gorgens, K. (2016). Cannabis and adolescents: Exploring the substance misuse treatment provider experience in a climate of legalization. *International Journal of Drug Policy*, *33*, 66-74.

Somers, J.M., Goldner, E.M., Waraich, P., Hsu, L. (2006). Prevalence and incidence studies of anxiety disorders: a systematic review of the literature. *Can J Psychiatry*, 51:100-113.

Spitzer, R. L., Kroenke, K., Williams, J. B., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: the GAD-7. *Archives of Internal Medicine*, *166*(10), 1092-1097.

Syed, S. A., & Nemeroff, C. B. (2017). Early life stress, mood, and anxiety disorders. *Chronic Stress*, *1*, 1-16, 2470547017694461.

Thorsteinsson, E. B., Sveinbjornsdottir, S., Dintsi, M., & Rooke, S. E. (2013). Negative life events, distress, and coping among adolescents in Botswana.

Australian Journal of Educational & Developmental Psychology, *13*, 75–86.

Toteng, K. M. A., & Amone-P'Olak, K. (2019). Family background and socio-demographic correlates of cannabis use: A cross-sectional survey of University students in Botswana. *African Journal of Drug and Alcohol Studies*, *18*(1), 55-67.

Volkow, N. D., Swanson, J. M., Evins, A. E., DeLisi, L. E., Meier, M. H., Gonzalez, R., ... & Baler, R. (2016). Effects of cannabis use on human behavior, including cognition, motivation, and psychosis: a review. *JAMA Psychiatry*, *73*(3), 292-297.

Wang, Q., Dima, M., Ho-Foster, A., Molebatsi, K., Modongo, C., Zetola, N. M., & Shin, S. S. (2020). The association of household food insecurity and HIV infection with common mental disorders among newly diagnosed tuberculosis patients in Botswana. *Public Health Nutrition*, 1-9.

Whiteford, H. A., Degenhardt, L., Rehm, J., Baxter, A.J., Ferrari, A. J., Erskine, H.E., Charlson, F.J., Norman, R. E., Flaxman, A. D., Johns, N., Burstein, R., Murray, C. J., Vos, T., 2013. *Global burden of disease attributable to mental and substance use disorders: findings from the Global Burden of Disease Study 2010*. Lancet 382, 1575–1586.

Wörfel, F., Gusy, B., Lohmann, K., Töpritz, K., & Kleiber, D. (2016). Mental health problems among university students and the impact of structural conditions. *Journal of Public Health*, *24*(2), 125-133.

World Drug Report 2021 (United Nations publication, Sales No. E.21.XI.8).

Zvolensky, M.J., Bernstein, A., Sachs-Ericsson, N., Schmidt, N.B., Buckner, J.D., Bonn-Miller, M.O., 2006. Lifetime associations between cannabis use, abuse, and dependence and panic attacks in a representative sample. *J. Psychiatr. Res.* 40, 477–486.